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Declaration under Rule 4.17:

— of inventorship (Rule 4.17(iv)) for US only

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: CANCER IMMUNOTHERAPY USING POLYCOMB PROTEINS

(57) Abstract: The invention relates to the use of polycomb group proteins as a tumour-associated antigens. Polycomb group proteins are highly involved in body architecture development, haematopoiesis and cell cycle control. Aberrant expression of polycomb proteins has been linked with haematological malignancies, mainly lymphomas. This invention relates to the use of these polycomb group proteins as antigens for cancer immunotherapy. Immunological responses can be raised against these proteins and such responses are active against polycomb protein over-expressing tumour cells.

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INTERNATIONAL SEARCH REPORT

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| | | International Application No PCT/GB 03/05403 | |
| A. CLASSIFICATION OF SUBJECT MATTER IPC 7 A61K39/002 A61K48/00 C07K14/82 | | | |
| According to International Patent Classification (IPC) or to both national classification and IPC | | | |
| B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC 7 A61K C12N C07K | | | |
| Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched | | | |
| Electronic data base consulted during the international search (name of data base and, where practical, search terms used) BIOSIS, EPO-Internal, WPI Data, PAJ, CHEM ABS Data, MEDLINE | | | |
| C. DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. | |
| X | WO 98/07858 A (CHIRON CORP) 26 February 1998 (1998-02-26) | 1,2,5,6, 9-11, 13-20, 23,24, 26,28 | |
| Y | abstract page 5, line 25 page 7, line 18,19,22-24 page 12, line 5-23 page 15, line 14-27 page 16, line 14-29 page 17, line 13 page 18, line 19-23 page 20, line 26,27 ----- -/-- | 1-28 | |
| <input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. | | <input checked="" type="checkbox"/> Patent family members are listed in annex. | |
| * Special categories of cited documents : *A* document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed | | *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. * & document member of the same patent family | |
| Date of the actual completion of the international search 19 April 2004 | | Date of mailing of the international search report 07/06/2004 | |
| Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016 | | Authorized officer Lechner, O | |

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International Application No
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| C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT | | |
|--|---|---|
| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| X | US 6 140 483 A (RANDAZZO FILIPPO) 31 October 2000 (2000-10-31) | 1,2,5,6, 9-11, 13-20, 23,24, 26,28 1-28 |
| Y | abstract column 2, line 15-17,33,34 column 3, paragraphs 3,5 column 6, line 51,52 column 8, paragraph 2 column 11, paragraphs 2,5 column 12, paragraphs 1,2 | |
| X | DE 195 16 776 A (BOEHRINGER INGELHEIM INT) 14 November 1996 (1996-11-14) | 1,2,4,6, 9-11, 13-16, 18-20, 23,24,26 1-28 |
| Y | abstract column 1, line 54,55 column 2, line 34-43 column 6, line 37-41 column 8, line 33-46,56,57 column 9, line 3-5,21-31 claims 1,4,5,19 | |
| X | HAMER K M ET AL: "A PANEL OF MONOCLONAL ANTIBODIES AGAINST HUMAN POLYCOMB GROUP PROTEINS" HYBRIDOMA AND HYBRIDOMICS, MARY ANN LIEBERT, NEW YORK, NY, US, vol. 21, no. 4, August 2002 (2002-08), pages 245-252, XP008015767 ISSN: 1536-8599 abstract page 246, left-hand column, paragraphs 1,2 | 2,6,10, 11,13,14 |
| X | ATSUTA T ET AL: "Production of monoclonal antibodies against mammalian Ring1B proteins." HYBRIDOMA. UNITED STATES FEB 2001, vol. 20, no. 1, February 2001 (2001-02), pages 43-46, XP002277203 ISSN: 0272-457X abstract paragraph 'METHODS! | 2,6,8, 10,11, 13-15 |
| A | ZETTER BRUCE R ET AL: "Cancer. The silence of the genes." NATURE. ENGLAND 10 OCT 2002, vol. 419, no. 6907, 10 October 2002 (2002-10-10), pages 572-573, XP002277200 ISSN: 0028-0836 the whole document | 1-28 |

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INTERNATIONAL SEARCH REPORT

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| C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT | | |
|--|---|-----------------------|
| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| A | JACOBS J J L ET AL: "Polycomb repression: from cellular memory to cellular proliferation and cancer" BBA - REVIEWS ON CANCER, ELSEVIER SCIENCE BV, AMSTERDAM, NL, vol. 1602, no. 2, 21 June 2002 (2002-06-21), pages 151-161, XP004356807 ISSN: 0304-419X abstract ----- | 1-28 |

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 03/05403**Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

Although claims 18-28 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

In International Application No
PCT/GB 03/05403

| Patent document cited in search report | | Publication date | Patent family member(s) | Publication date |
|---|---|---------------------|----------------------------|---------------------|
| WO 9807858 | A | 26-02-1998 | AU 4085297 A | 06-03-1998 |
| | | | AU 4328397 A | 06-03-1998 |
| | | | EP 0927250 A1 | 07-07-1999 |
| | | | EP 0920508 A1 | 09-06-1999 |
| | | | WO 9807858 A1 | 26-02-1998 |
| | | | WO 9807860 A1 | 26-02-1998 |
| | | | US 6166191 A | 26-12-2000 |
| US 6140483 | A | 31-10-2000 | US 6677117 B1 | 13-01-2004 |
| | | | AU 5449098 A | 10-06-1998 |
| | | | AU 5449198 A | 10-06-1998 |
| | | | EP 0948618 A1 | 13-10-1999 |
| | | | EP 0938559 A2 | 01-09-1999 |
| | | | WO 9822585 A1 | 28-05-1998 |
| | | | WO 9822586 A2 | 28-05-1998 |
| | | | US 2004006210 A1 | 08-01-2004 |
| | | | US 6673911 B1 | 06-01-2004 |
| DE 19516776 | A | 14-11-1996 | DE 19516776 A1 | 14-11-1996 |
| | | | CA 2220442 A1 | 14-11-1996 |
| | | | WO 9635784 A2 | 14-11-1996 |
| | | | EP 0827537 A2 | 11-03-1998 |
| | | | JP 2001505402 T | 24-04-2001 |
| | | | US 6689583 B1 | 10-02-2004 |